

电位调控沉积物中氯酚生物 电刺激还原脱氯研究

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摘 要：生物修复作为当前极为关注的一种沉积物原位修复技术，在有效去除氯酚的同时不会对环境造成负面影响。微生物驱动下氯酚类化合物的厌氧还原降解通常存在操控性弱，反应不彻底等缺点，寻找一个理想的电子供体成为提高还原效率和减少副反应的关键。以模拟受对氯苯酚污染的河流底泥沉积物为研究对象，提前分别驯化出阳极和阴极微生物，以生物阳极为辅助电极，以生物阴极为工作电极，分别给阴极施加-0.1、-0.3、-0.5、-0.7V 的恒定电位，以控制电位高低的方式掌握供给生物阴极生长所需能量的大小，考察了对氯苯酚在沉积物底泥和上覆水中的分配情况以及反应运行阶段电流变化情况。结果表明，在该反应装置规格和实验条件下，静置分层后上覆水和底泥中对氯苯酚含量比约为 1：1.2，对氯苯酚在水中扩散溶解的部分不可忽略。在施加-0.7V 电位的条件下，电流在 4.2 小时达到峰值，为 1.26mA，远高于生物阳极驯化阶段的 0.56mA，此时电子传递速率最快，也说明此时电化学活性菌已经比较适应在设定条件下高效降解目标污染物。

关键词：沉积物；还原脱氯；对氯苯酚；

Reduction and dechlorination of chlorophenol by bioelectrical stimulation in sediments regulated by potential

Abstract: Bioremediation, as an original sediment remediation technology, is of great concern at present. It can effectively remove chlorophenol without causing negative effects on the environment. The anaerobic reduction degradation of chlorophenols driven by microorganisms usually has some shortcomings such as weak control and incomplete reaction, so finding an ideal electron donor is the key to improve the reduction efficiency and reduce side reactions. Us to simulate the chlorine phenol pollution of river sediment deposits as the research object, the domestication of anode and cathode respectively in advance microbes, biological anode as auxiliary electrode, biological cathode as working electrode, the cathode respectively under 0.1, 0.3, 0.5 and 0.7 V constant potential, to control the way of the potential and master supply biological cathode energy they need to grow, the size of the investigated on chlorine phenol in sediment and the reaction of the distribution of sediment and overlying water running stage current changes. The results showed that the content ratio of p-chlorophenol in the overlying water and the bottom mud after static stratification was about 1:1.2, and the part of p-chlorophenol diffused in water could not be neglected. Under the condition of -0.7V potential, the current reached its peak value at 1.26mA at 4.2 hours, far higher than 0.56mA at the bianodic domestication stage. At this time, the electron transfer rate was the fastest, indicating that the electrochemical active bacteria had been relatively adapted to degrade the target pollutants efficiently under the set conditions.

Key words: sediment; catalytic reductive dehalogenation; parachlorophenol

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